HL Data Analysis, Prob and Stats Practice Questions
03/01/2007

Student Name: ______________________________

Class: ______________________________

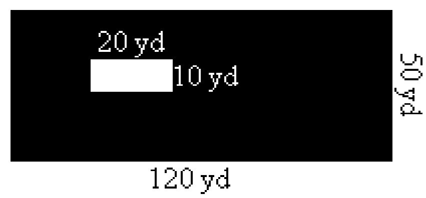
Date: ______________________________

Instructions: **Read each question carefully and select the correct answer.**

1. A new type of golf club claims to allow the user to hit a golf ball further than 150 yards 99% of the time. If this claim is true, and someone practices by hitting 125 golf balls, how many of those balls are expected to land **less than** 150 yards away? Round your answer to the nearest whole number.

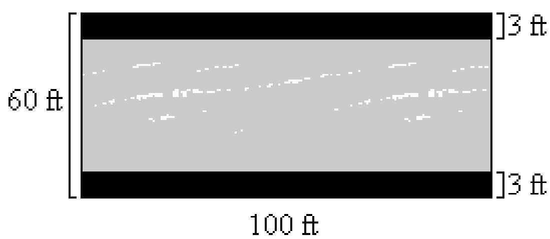
A. 123
B. 124
C. 2
D. 1

2. A baseball player is trying to hit a ball over the adjacent stadium's wall onto a spot on the football field. The football field is 50 yards wide and 120 yards long, including the end zones. The spot on the field the baseball player is trying to hit is 10 yards by 20 yards. If the ball goes over the stadium wall and onto the football field, what is the probability that it will hit the spot? Assume the baseball player's skill level has no bearing on the probability, and round your answer to the nearest hundredth.



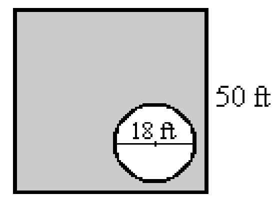
A. 0.96
B. 0.04
C. 0.97
D. 0.03

3. A group of people are parachuting off of a bridge today. The river below has a bank on each side that is 3 feet wide. The entire area is 60 feet wide and 100 feet long. What is the probability that they will land in the water and NOT on the the river bank? Round your answer to the nearest hundredth, if necessary.



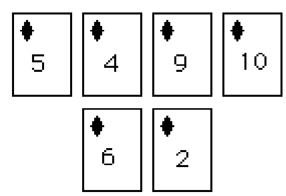
A. 0.60
B. 0.54
C. 0.10
D. 0.90

4. As part of a drill, a fire department helicopter pilot must drop supplies onto a circular landing zone on a rooftop. The supplies must land entirely within the circular landing zone, which has a diameter of 18 feet. The rooftop is square, and has a width of 50 feet. What is the probability that the pilot will drop the supplies in the landing zone, if the skill level of the pilot is not a factor? Use $\pi = 3.14$ and round your answer to the nearest hundredth, if necessary.



A. 0.11
B. 0.90
C. 0.10
D. 0.41

5. To answer the question, please refer to the cards.



If you were to draw a card (without peeking), what is the probability of getting an odd number?

A. 1/3
B. 6/2
C. 2/3
D. 1

6. Randall guesses the answer to a multiple choice question with 6 possible choices. What is the probability that his guess was wrong?

A. $\frac{1}{6}$

B. $\frac{3}{4}$

C. $\frac{5}{6}$

D. $\frac{1}{5}$

7. Wayne's has played his favorite video game 55 times and has won 30 times.

If Wayne plays one game every day for the next 66 days, how many games can Wayne expect to win?

A. 66 games
B. 36 games
C. 11 games
D. 5/6 of a game

8. In a bag, there are 26 different letters of the alphabet: 5 vowels and 21 consonants. If one letter is randomly chosen from the bag, what is the probability that it will be a consonant?

A. $\frac{5}{21}$

B. $\frac{5}{26}$

C. $\frac{21}{26}$

D. $\frac{21}{5}$

9. **State whether the following event is dependent or independent and solve.** Salina is buying two kid's meals at a fast food restaurant. The restaurant only has seven toys left that can be included in the meals: 2 dolls, 1 monkey, 1 jacks game, 2 balls, and 1 car. Each toy has an equal chance of being included with a kid's meal. What is the probability that Salina will get a meal with a doll and then a meal with a car?

A. Independent; $\frac{2}{49}$

B. Dependent; $\frac{2}{49}$

C. Independent; $\frac{1}{21}$

D. Dependent; $\frac{1}{21}$

10. Julisha is creating a flower arrangement for her sister. She has 3 red roses, 7 pink roses, 4 white daisies, and 6 yellow daffodils to choose from. What is the probability that she will choose a white daisy and then a yellow daffodil for the arrangement?

A. $\frac{3}{50}$

B. $\frac{6}{95}$

C. $\frac{49}{95}$

D. $\frac{1}{2}$

11. Gurshawn is getting dressed to go to a wedding. He has 6 shirts (2 white, 1 beige, and 3 blue) and 5 ties (3 solid and 2 patterned) to choose from. What is the probability that Gurshawn will choose a blue shirt and a patterned tie?

A. $\frac{3}{55}$

B. $\frac{1}{5}$

C. $\frac{9}{10}$

D. $\frac{26}{55}$

12. Roberto tosses a coin and a six-sided die. The numbers on the die are 1 through 6.

What is the probability that Roberto will toss a head and roll a 3?

A. $\frac{1}{4}$

B. $\frac{1}{6}$

C. $\frac{1}{12}$

D. $\frac{2}{3}$

13. Stanley Speilbug is a movie producer who has searched the country for actors to play the parts of Mrs. Reynolds, Ms. Parker, and Dr. Linda Robbins, in his next movie. If the same seven people tried out for all three parts, how many different casts for the movie are possible?

A. 10
B. 21
C. 63
D. 210

14. Telemarketers can predict the number of contacts they will make in a shift based on the time, product, and call destination. All of these factors for an upcoming shift indicate it has a 61% chance of being a good shift. If a caller makes 15 contacts during a good shift and 3 contacts during a bad shift, calculate the expected number of contacts for the upcoming shift. Round the answer to the nearest whole number.

A. 9 contacts
B. 10 contacts
C. 1 contact
D. 7 contacts

15. In your sock drawer, you have 6 white socks, 3 grey socks, 4 black socks, and 2 navy blue socks. You like to wear 4 socks to school every day. How many different combinations of 4 socks can you pull out of your sock drawer?

A. 15
B. 24
C. 144
D. 60

16. A salesman can estimate his yearly income based on his number of appointments, the economy, and product development. These factors show that one salesman has a 35% chance of having a good year. If sales people make $125,000 in a good year and $50,000 in a bad year, what can this salesman expect his salary for the year to be?

A. $43,750
B. $32,500
C. $76,250
D. $61,250

HL Data Analysis Prob and Stats Practice
Answer Key
03/01/2007

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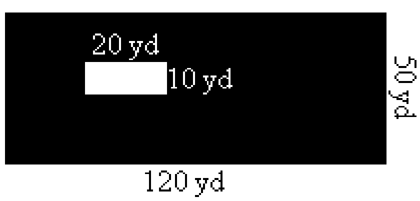
D. 1
Theoretical Probability - B

2. A baseball player is trying to hit a ball over the adjacent stadium's wall onto a spot on the football field. The football field is 50 yards wide and 120 yards long, including the end zones. The spot on the field the baseball player is trying to hit is 10 yards by 20 yards. If the ball goes over the stadium wall and onto the football field, what is the probability that it will hit the spot? Assume the baseball player's skill level has no bearing on the probability, and round your answer to the nearest hundredth.



D. 0.03
Theoretical Probability - B

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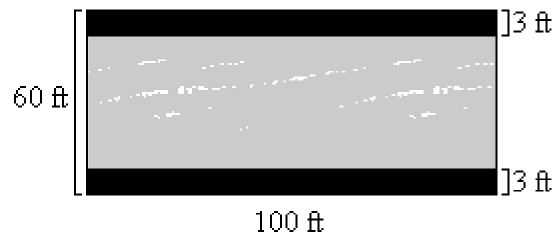

D. 0.90
Theoretical Probability - B

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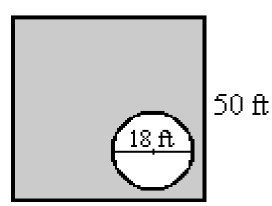

C. 0.10
Theoretical Probability - B

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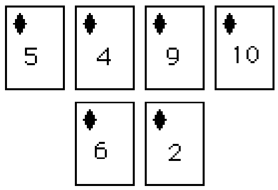

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A. 1/3
Probability/Statistics - B

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D. Dependent; $\frac{1}{21}$
Independent/Dependent Events

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Probability

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B. 10 contacts
Probability

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Probability

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C. $76,250
Probability

Study Guide

HL Data Analysis Prob and Stats Practice
03/01/2007

Theoretical Probability - B
Probability is the likelihood that a given event will occur. There are two types of probabilities: theoretical and experimental. Theoretical probability is a strictly mathematical probability. It is determined by taking the ratio of the number of ways an event can occur to the total number of possibilities in the sample space. Experimental probability is a probability that is determined using the results of an experiment. It is determined by taking the ratio of the number of times the event occurred in the experiment to the total number of possibilities in the sample space. This study guide will focus on theoretical probability.

To determine the theoretical probability of an event:
The probability or "chance" of an event is determined by two groups of outcomes. The first is how many outcomes are possible in a probability situation, such as the rolling of a die or tossing a coin. In the case of rolling a six-sided fair die, there are six possible outcomes, $\{1, 2, 3, 4, 5, 6\}$.
The group or set of all the possible outcomes is called the sample space for an experiment. The second group of outcomes to be determined is a subgroup or subset of the sample space called the event. For example, if a six-sided fair die is rolled, the event that the outcome is an odd number would have three possible outcomes $\{1, 3, 5\}$.
The probability of an event, *E*, denoted P(*E*), is determined by the following formula:

$$P(E) = \frac{\textbf{number of elements in the event}}{\textbf{number of elements in the sample space}} = \frac{n(E)}{n(S)}$$

where *S* represents sample space.

Note that the above formula is only valid in situations where each outcome in the sample space is equally likely to occur, such as when a six-sided fair die is rolled. Any of the six possible outcomes are just as likely to occur as another. In addition, if the number of elements in the event is the same as the number of elements in the sample space, that is n(*E*) = n(*S*), then P(*E*) = 1.

Example 1: If a six-sided fair die is rolled, find the probability of rolling an odd number.

(1) S = {1,2,3,4,5,6}
Therefore, n(S) = 6

(2) E = {1,3,5}
Therefore, n(E) = 3

$$\textbf{(3)}\ P(E) = \frac{n(E)}{n(S)} = \frac{3}{6} = \frac{1}{2}$$

Step 1: There are six possible outcomes when a six-sided fair die is rolled. Thus, the number of elements in the sample space is 6, so n(*S*) = 6.
Step 2: There are three possible outcomes of the event of rolling an odd number. The number of elements in the event is 3, so n(*E*) = 3.
Step 3: Substitute the values of n(*E*) and n(*S*) in the probability formula, 3 and 6, respectively. Then simplify the fraction.

Answer: 1/2 or 0.5

The sum of the probabilities of a sample space:
The sum of all the probabilities of a sample space is one. For example, if a six-sided fair die is rolled, the probability of rolling any number 1 - 6 is 1/6 (or 0.16 where the 6 repeats). The sum of the probabilities is found below.

$$P(1)=\frac{1}{6},\quad P(2)=\frac{1}{6},\quad P(3)=\frac{1}{6},$$
$$P(4)=\frac{1}{6},\quad P(5)=\frac{1}{6},\quad P(6)=\frac{1}{6},$$

$$P(1,2,3,4,5,6)=\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}=\frac{6}{6}=1$$

Using this information, it can be said that if the probability of an event occurring is P(*E*), then the probability of the same event NOT occurring is 1 - P(*E*).

Example 2: The probability of seeing a blue jay in December is 0.05. What is the probability of NOT seeing a blue jay in December?

Solution: Use the sum of probabilities formula to determine the necessary probability. P(*E*) = 0.05, P(not *E*) = 1 - P(*E*). Substitute the value of P(*E*) into the formula: 1 - 0.05 = 0.95.

Answer: The probability of NOT seeing a blue jay in December is 0.95.

Applying theoretical probability in real world situations:
Once the student is comfortable with the idea of theoretical probability and the sum of the probabilities of an event, he or she will be ready to apply probability to real world situations.

Example 3: The probability of Babe Ruth hitting a home run when up to bat was 0.085. If he got up to bat 5,000 times, how many home runs would he be expected to hit? Round your answer to the nearest whole number, if necessary.

$$(1)\ \ 0.085 \times 5{,}000 = 425$$

Step 1: To determine the number of expected home runs, multiply the probability of hitting a home run (0.085) by the number of times he was up to bat (5,000).

Answer: Babe Ruth would be expected to hit 425 home runs.

Example 4: A light bulb manufacturing company has determined that the probability that a brand new light bulb will NOT work is 0.013. If the company shipped 7,235 light bulbs yesterday, how many of the light bulbs can be expected to work? Round your answer to the nearest whole number.

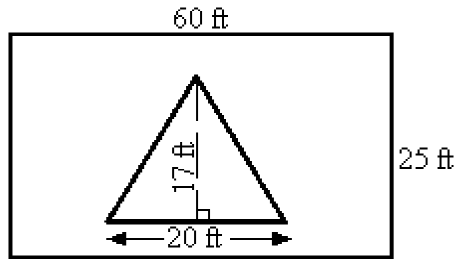
$$(1)\ \ 1-0.013=0.987$$
$$(2)\ \ 0.987\times 7{,}235=7{,}140.945\approx 7{,}141$$

Step 1: Determine the probability that a light bulb WILL work by subtracting the probability that it will NOT work from 1.
Step 2: Multiply the probability that a light bulb will work by the number of light bulbs shipped and round the answer to the nearest whole number.

Answer: 7,141 light bulbs would be expected to work.

Example 5: Evan and his teammates are participating in the egg drop at their school. The egg will be dropped from the top of the school building and it needs to land in a triangular region of the grassy area in the schoolyard. The schoolyard is a rectangular area that is 60 feet long and 25 feet wide. The landing zone is a triangle with a height of 17 feet and a base of 20 feet. What is the probability that the egg will land in the triangular landing zone? Round your

answer to the nearest hundredth, if necessary.



(1) $60 \text{ ft} \times 25 \text{ ft} = 1{,}500 \text{ ft}^2$

(2) $\frac{1}{2}(20 \text{ ft})(17 \text{ ft}) = 170 \text{ ft}^2$

(3) $\frac{170 \text{ ft}^2}{1{,}500 \text{ ft}^2} = 0.11\overline{3} \approx 0.11$

Step 1: Determine the area of the rectangular schoolyard (the entire area where the egg could land).
Step 2: Determine the area of the triangular landing zone (the area where they want the egg to land).
Step 3: The probability of landing in the landing zone can be determined by finding the probability that the egg will land in the correct amount of area. Divide the area of the triangular landing zone by the area of the rectangular schoolyard and round the answer to the nearest hundredth.

Answer: The probability that the egg will land in the triangular landing zone is 0.11.

An activity that could help to reinforce this skill is to look at the sports section of a newspaper to find player statistics. Then have the student make predictions using this data. For example, have the student predict the number of times a basketball player will or will not score baskets based on a given number of tries.

Probability/Statistics - B
Probability is the ratio of the number of times a certain outcome can occur to the number of total possible outcomes. The probability of an event cannot be smaller than zero or larger than 1.
Statistics is the study of numerical data. This data is collected, classified, and analyzed to provide a meaningful presentation.

One of the best ways to introduce the student to probability and statistics is to use activities he or she enjoys. If the student likes to play marbles, have him or her put marbles of different colors in a bag. Then, help him or her use probability calculations to figure out the likelihood of certain events. (Example: pulling a blue marble out of the bag.)

Example 1: If there are 6 green marbles, 3 orange marbles, 2 blue marbles, and 1 black marble in a bag, what is the probability that either an orange or black marble will be blindly pulled from the bag first?

Solution: Start with the number of marbles in the bag. There is a total of 12. Then, figure out how many marbles are either orange or black. There are 4 (3 orange and 1 black). The probability ratio is 4/12, or, in reduced form, 1/3.

The probability that either an orange or a black marble will be blindly pulled out of the bag first is 1/3.

A standard deck of cards contains 52 cards. If the event requires picking cards out of a standard deck. A deck is composed of four different suits: spades, clubs, diamonds, and hearts. Each suit contains 13 cards. The suits of diamonds and hearts are red cards and the suits of spades and clubs are black cards.

Example 2: If you were to draw a playing card from a standard deck of 52 cards, what is the probability of drawing a 3 of diamonds?

Solution: Since there are 52 cards in the deck, and there is only one 3 of diamonds, the probability is 1/52.

Independent/Dependent Events
If two events (A and B) are independent, then the probability (P) that both will happen is calculated by multiplying P(A) by P(B). Two events are dependent if the first event (A) effects the outcome of the second event (B). If two events are dependent, the probability (P) is calculated by multiplying P(A) by P(B based on A). To understand independent and dependent events, students need to understand simple probability.

Two events are independent if the probability of one event happening has no influence on the probability of the other event happening. If two events are independent, the formula for determining the probability of both events is:
Probability(A and B) = Probability(A) × **Probability(B)** or **P(A and B) = P(A)** × **P(B)**

Before beginning to solve these types of problems, the student should first ask the question, does the chance of the second event occurring have anything to do with the first event occurring? If the answer is no, the events are independent. If the answer is yes, the events are dependent.

Example 1: Suppose a penny and a nickel are tossed in the air. What is the probability that both coins will land heads up?

(1) P(A and B) = P(A) × P(B)
(2) P(A and B) = 1/2 × 1/2
(3) P(A and B) = 1/4

Step 1: Select the appropriate formula. If you toss a penny and a nickel into the air, you know that whether the nickel lands heads up has nothing to do with whether the penny will land heads up or tails up. Let A represent the probability of the penny landing heads up and B represent the probability of the nickel landing heads up. P represents the word probability and events A and B are independent events.
Step 2: The probability of the penny landing heads up is 1/2. The probability of the nickel landing heads up is 1/2. Substitute the probability of A and the probability of B into the formula.
Step 3: Multiply 1/2 by 1/2 to get 1/4.

Answer: $\frac{1}{4}$ (or 25%)

Dependent events are events where one event effects the outcome of the other; therefore, influencing their combined probability. If two events are dependent, the formula for determining the probability of both events is:
Probability(A and B) = Probability(A) × **Probability(B, given A)** or **P(A and B) = P(A)** × **P(B, given A)**.

Example 2: Suppose that a jar contains 10 pieces of paper with the numbers 1 through 10 written on them. If Jorge reached into the jar, without looking, what is the probability that he will pull out the 1 and then, without replacing the first piece of paper, pull out the 5?

(1) P(A and B) = P(A) × P(B, given A)
(2) P(A and B) = 1/10 × 1/9
(3) P(A and B) = 1/90

Step 1: This scenario, unlike the one above, is an example of dependent events. Let A represent the probability that the first piece of paper has the number 1 and let B represent the probability that the second piece of paper has the number 5. P represents the word probability and the events A and B are dependent successive events. Select the appropriate formula.
Step 2: There are 10 pieces of paper in the jar before the first piece of paper is drawn and 1 of those pieces of paper has the number 1 on it, so the probability of pulling out a 1 on the first try is 1/10. The probability of A is 1/10. After the first piece of paper is drawn, there are only 9 pieces of paper left in the jar. The probability of B, given A is 1/9. Substitute the probabilities into the formula.

Step 3: Multiply the fractions. Remember, multiply the numerators straight across ($1 \times 1 = 1$) and the denominators straight across ($10 \times 9 = 90$).

Answer: $\frac{1}{90}$ (or $1 \div 90 = 0.0111$ or 1.11%)

Example 3: Determine whether the events are dependent or independent and solve.

Find the probability of tossing two fair number cubes and getting a 4 on each one.

(1) A cube has 6 sides.

(2) $P(4) = \frac{1}{6}$

(3) $P(A \text{ and } B) = P(A) \times P(B)$

(4) $P(4 \text{ and } 4) = \frac{1}{6} \times \frac{1}{6}$

(5) $\frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$

Step 1: Remember a cube has 6 sides so the sample space is 1, 2, 3, 4, 5, 6
Step 2: The probability of rolling a 4 is 1 out of 6 for each number cube.
Step 3: Use the formula, $P(A \text{ and } B) = P(A) \times P(B)$ since these are independent events.
Step 4: Multiply 1/6 by 1/6 to get 1/36.

Answer: Independent; $\frac{1}{36}$

Example 4: Determine whether the events are dependent or independent and solve.

A cup contains a quarter, a nickel, and a penny. Find the probability of choosing a quarter first and then a penny without replacing the quarter.

(1) Dependent

(2) $P(A) = \frac{1}{3}$

(3) $P(B) = \frac{1}{2}$

(4) $P(A \text{ and } B) = \frac{1}{3} \times \frac{1}{2}$

(5) $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$

Step 1: The events are dependent since the second outcome depends on the first one.
Step 2: The probability of choosing a quarter is 1 out of 3 possibilities. Let A represent the event a quarter is chosen.
Step 3: The probability of choosing a penny after the quarter is 1 in 2 since there are only 2 coins left. Let B represent the event a penny is chosen after the quarter.
Step 4: Substitute the individual probabilities into the formula.
Step 5: Multiply $1/3 \times 1/2$ to get 1/6.

Answer: Dependent; $\frac{1}{6}$

Have the student brainstorm a list of independent and dependent events. He or she may need the help of a math textbook or the Internet. If possible, have the student carry out the experiments on the brainstorm list. Verify the outcomes using the formulas provided in this study guide.

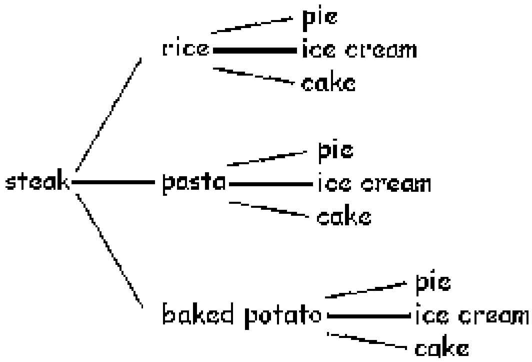
Probability

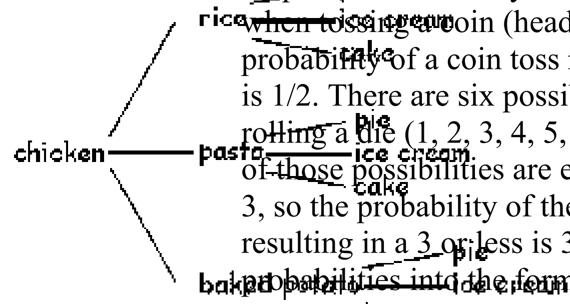
Probability is the measure of the chance that a specific outcome will occur. Probability methods at this level include using tree diagrams, sample space, the fundamental counting principle, adding and multiplying probabilities for independent and dependent events, calculating expected value, conditional probability, experimental probability, and theoretical probability.

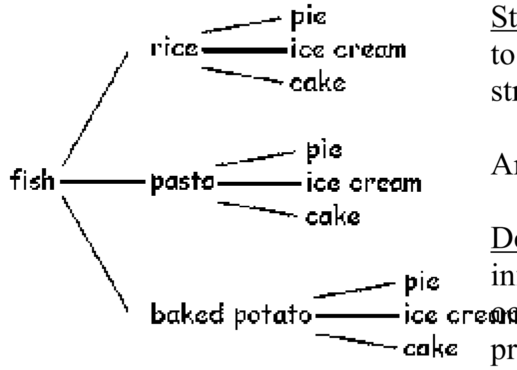
Tree diagrams are probability tools which represent possible outcomes. If you went to dinner at a banquet, you may be presented with the following possibilities:

Main dishes: steak, fish, chicken
Side dishes: rice, pasta, baked potato
Dessert: pie, ice cream, cake

Suppose that at this dinner you were asked to choose one item from each category: one main dish, one side dish, and one dessert. How many different possible meals could you choose? A tree diagram which gives the sample space (the choices) would help you quickly count the choices:







The above illustration is a tree diagram. All that is left to do is to count the choices down the right side of each branch: there are 27 different possible meals.

Two events are <u>independent</u> if the probability of one event happening has no influence on the probability of the other event happening. If you roll one die and toss one coin, you know that the number on the die has nothing to do with whether the coin toss results in heads or tails. The formula for determining the probability that two independent events will occur is below.

P(A and B) = Probability of A x Probability of B = P(A) x P(B)

Example 1: What is the probability a coin toss resulting in heads and a roll of the die resulting in a 3 or less?

(1) P(A and B) = P(A) x P(B)
(2) P(A and B) = 1/2 x 3/6
(3) P(A and B) = 1/2 x 1/2
(4) P(A and B) = 1/4

<u>Step 1</u>: Choose the correct formula for the probability of A and B happening.
<u>Step 2</u>: There are only two possibilities when tossing a coin (heads and tails), so the probability of a coin toss resulting in heads is 1/2. There are six possibilities when rolling a die (1, 2, 3, 4, 5, and 6). Only three of those possibilities are equal to or less than 3, so the probability of the roll of a die resulting in a 3 or less is 3/6. Substitute the probabilities into the formula.
<u>Step 3</u>: Reduce the fractions before multiplying.
<u>Step 4</u>: 1/2 times 1/2 equals 1/4. Remember to multiply numerators and denominators straight across.

Answer: 1/4

<u>Dependent events</u> are events which influence one another's probability of occurring. The formula for determining the probability that two dependent events will occur is below.

P(A and B) = Probability of A x Probability of B given A = P(A) x P(B, given A)

Example 2: If you draw one card from a deck, put it aside, and then draw another card, what is the probability that each card drawn is a heart?

(1) P(A and B) = P(A) x P(B, given A)
(2) P(A and B) = 13/52 x 12/51
(3) P(A and B) = 156/2652
(4) P(A and B) = 13/221

<u>Step 1</u>: Choose the correct formula for the probability of A and B happening.
<u>Step 2</u>: There are 52 cards in a deck of cards. 13 of the cards in each deck are hearts. The probability that the first card drawn is a heart is 13/52. The probability that the second card drawn is a heart is 12/51 because there is one less heart in the deck and one less card in the deck. Substitute the probabilities into the formula.
<u>Step 3</u>: Multiply the fractions. Remember to

multiply numerators straight across and denominators straight across.
Step 4: Reduce the fraction completely.

Answer: 13/221

The formula for calculating expected value is:
(E = result of outcome #1 x probability of a outcome #1 + result of outcome #2 x probability of outcome #2).
Businesses can use such a formula to roughly project expected profits under specific conditions.

Example 3: Suppose you owned a snack bar at a beach. Let's say that in a good summer you make \$3,000 and in a bad summer you lose \$50. The greatest determining factor of a good or bad year has been the weather, and all indications show that the approaching summer season has an 89% chance of being sunny and warm - a good year. What is your projected profit for the approaching season?

(1) E = (\$3,000 x 0.89) + (-\$50 x 0.11)
(2) E = (\$2,670) + (-\$5.50)
(3) E = \$2,664.50

Step 1: The result of a good summer is \$3,000 and the probability that there will be a good summer is 89% (0.89). The result of a bad summer is losing \$50 (-\$50) and the probability that there will be a bad summer is 11% (0.11). Use these values to fill in the formula for calculating the expected value.
Step 2: Multiply \$3,000 by 0.89 to get \$2,670 and multiply -\$50 by 0.11 to get -\$5.50.
Step 3: Add the results of Step 2.

The expected profit for the approaching summer season is \$2664.50.

To calculate conditional probability, you must find the probability of an event based on the fact that another event has already happened.

Example 4: An algebra class gets a new student, a girl. This new student happens to have two younger siblings. Find the probability that one of the new student's siblings is also a girl.

Solution: Examine all of the possible ways three siblings might be arranged in terms of their gender. The fact that the first sibling, the new girl in class, is a girl alters the possible choices for the problem. The possibilities for the genders of 3 siblings are: GGG (Girl, Girl, Girl), GGB, GBG, GBB, BGG, BGB, BBG, BBB. From these possibilities, you can cancel out any that don't begin with G since we know that the oldest sibling is a girl. That leaves us with 4 possibilities: GGG, GGB, GBG, and GBB. Three of these result in two siblings that are girls. Therefore the probability that at least two of the siblings are girls is 3/4 or 75%.

Experimental probability is a way to predict future events using data from past events. Experimental probability is calculated by dividing the number of occurrences of an event by the number of trials of an experiment. A football coach, for example, can predict how well his receiver will complete passes. If the receiver has been completing 10 out of every 25 passes thrown to him, then the coach can use experimental probability to predict how well he will complete passes in the next game: 10/25 = 0.4 or 40%. The prediction is that the receiver will complete 4 out of 10 or 2 out of 5 passes thrown to him.

In contrast, theoretical probability or mathematical probability refers to finding the probability of an event before any trials of an experiment have been performed. Often theoretical or mathematical probability is referred to as just probability.

If you want to find the probability of rolling a die and getting a 4, you simply set up the fraction 1/6 (1 because there is only one 4 on the die and 6 because there are six sides

on the die meaning six different possible outcomes.) Therefore, before we even roll a die, we know that theoretical probability tells us that we have a 1 in 6 chance of rolling a 4.

<u>The Counting Principle</u>

Counting the choices involves determining how many choices are available in a given situation. If there are A choices for one way and B choices for another, then the total number of choices is A x B.

Example 5: Ana went to the world's largest amusement park. There were 10 different rides, 14 roller coasters, 8 shows, and 6 shops. How many different ways can Ana see all of the attractions?

<u>Solution</u>: Multiply 10 x 14 x 8 x 6 = 6,720

Answer: 6,720 ways